

## Okeanos Explorer ROV Dive Summary

Dive Information			
Dive Map			
Site Name	Deeper dive on "Utu" seamount		
ROV Lead(s)	Karl McLetchie		
Expedition Coordinator(s)/ Mapping Lead	Kelley Elliott / Meme Lobecker		
Science Team Lead(s)	Santiago Herrera (Biology) and Matt Jackson (Geology)		
General Area Descriptor	North Samoan region, Near southern margin of Manihiki Plateau		
ROV Dive Name			
Cruise	EX1702		
Leg			
Dive Number	08		
Equipment Deployed			
ROV	Deep Discoverer (D2)		
Camera Platform	Seirios		
ROV Measurements	<input checked="" type="checkbox"/> CTD	<input checked="" type="checkbox"/> Depth	<input checked="" type="checkbox"/> Altitude
	<input checked="" type="checkbox"/> Scanning Sonar	<input checked="" type="checkbox"/> USBL Position	<input checked="" type="checkbox"/> Heading
	<input checked="" type="checkbox"/> Pitch	<input checked="" type="checkbox"/> Roll	<input checked="" type="checkbox"/> HD Camera 1

	<input checked="" type="checkbox"/> HD Camera 2	<input checked="" type="checkbox"/> Low Res Cam 1	<input checked="" type="checkbox"/> Low Res Cam 2
	<input checked="" type="checkbox"/> Low Res Cam 3	<input checked="" type="checkbox"/> Low Res Cam 4	<input checked="" type="checkbox"/> Low Res Cam 5
	<input checked="" type="checkbox"/> LSS	<input checked="" type="checkbox"/> ORP	
Equipment Malfunctions			
ROV Dive Summary (from processed ROV data)	In Water:	2017-02-23T19:15:50.952000 12°, 16.612' S ; 168°, 22.159' W	
	Out Water:	2017-02-24T03:33:05.515000 12°, 15.840' S ; 168°, 21.991' W	
	Off Bottom:	2017-02-24T01:35:08.205000 12°, 16.432' S ; 168°, 22.036' W	
	On Bottom:	2017-02-23T21:42:43.399000 12°, 16.452' S ; 168°, 22.098' W	
	Dive duration:	8:17:14	
	Bottom Time:	3:52:24	
	Max. depth:	3931.9 m	
Special Notes			
Scientists Involved (please provide name, location, affiliation, email)	Asako Matsumoto, PERC, Chiba Institute of Technology, Japan Bruce Mundy, NOAA PIFSC Les Watling, University of Hawaii at Manoa Scott France, University of Louisiana at Lafayette Tara Harmer Luke, Stockton University Matthew Jackson, UC Santa Barabara Santiago Herrera, Lehigh University		
Purpose of the Dive	<p>The goal of this dive was to generate baseline information on geology and geochemistry of this unexplored (and largely unmapped) seamount. There is also significant interest in understanding the deep sea habitats and biological communities on the seamount to better understand their diversity and distribution.</p> <p>Maps of the seamount were generated two days before this dive for preparation for the first dive on this seamount; the first dive (Dive 6) was in the crater on the summit of the seamount. This dive (Dive 8) targets the deeper flanks of the volcano, and focuses on the the volcanic platform upon which the volcano is constructed. From a geological standpoint, this seamount may be an older seamount linked to the Society hotspot, not Samoa. Samples from this seamount are key in defining the Society hotspot tracks back in time, and as such an age on a volcanic rock is needed from this seamount. Without an age, it is not possible to truly define plate motion for the time frame represented by this volcano.</p>		



	<p>From the biological perspective this dive has the potential to provide new depth records for several species as well the discovery of new species. Very little work has been done in the Central Pacific at these depths on seamounts. We aimed to collect information that will inform the biogeographic identity of the communities at abyssal depths in this region.</p>
<p>Description of the Dive</p>	<p>The seamount explored in this dive, tentatively called “Utu” seamount, lies in the northern region of the American Samoa EEZ. The shallow portion of this seamount was explored by ROV (Dive 6) two days prior to this dive (Dive 8). Thus, high-resolution maps of the dive site were already available from our prior efforts. The seamount appears to be comprised of two distinct structures: The base of the seamount is composed a “lumpy” or “blocky” structures, perhaps consistent with pillow or pillow mounds; the basal portion of the volcano is similar in morphology to “pancake” seamounts. Constructed on top of this basal pancake structure is a volcanic structure that has both steeper and smoother sides than the basal pancake portion of the volcano. These two morphologically different structures of the volcano (i.e., the pancake basal portion and the steeper sided upper section) are consistent with two stages of volcanic activity on this seamount. It is notable that the summit of the seamount is nearly flat-topped, and is host to a nicely developed volcanic crater: the center of the crater hosts a volcanic cone, and the crater walls exhibit at least two different “step-like” features, consistent with partial crater collapse like that which is observed in calderas at basaltic shield volcanoes at oceanic hotspots. The dive track was designed to target the flanks of one of the deep “pancake” structures at the base of seamount, transiting up the side of the pancake structure, and then crest the rim of the pancake structure and transit along the rim.</p> <p><b>The following geological description provides a chronological summary of the major geological features, or changes in the geology of the ocean floor, over the course of the dive:</b></p> <p><i>21:30:10.</i> The first view of the ocean floor revealed a relatively flat, FE (ferromanganese encrusted/encrustation) surface with ~10% sediment cover (like all prior dives at depths &gt;1000 m, the sediment is light in color). There appear to be FE cobbles and pebbles in the field of view. There is a possible flow structure in the middle of the field of view.</p> <p><i>21:47:49.</i> After moving perhaps 5 or 10 meters from the ‘on bottom’ location, the ROV shows a boulder field that appears to have been completely covered with FE and the boulders appear to be welded together with FE. It is possible that these boulders are actually pillows, but they may be too small to be pillow structures. Moving another 10 or 20 meters, the same surface geology is observed that was observed at 21:47:49; in this field of FE cobbles, a 20 cm cobble was sampled (it has a sponge attached). It was placed in the starboard rock box, the first rock sample of the dive. <b>D2_DIVE08_SPEC01GEO</b></p> <p><i>22:17:28.</i> The same surface geology continues, unchanged.</p> <p><i>22:24:07.</i> The surface geology has transitioned to a greater abundance of smoother surfaces (likely flows), which now represent ~50% of the field of view. The remaining 50% represents FE cobbles and pebbles.</p> <p><i>22:26:09.</i> Some outcrops in the field of view have the appearance of pillow basalt structures.</p> <p><i>22:27:30.</i> A deposit that looks like a talus debris deposit is in the field of view.</p>



The pebbles and cobbles appear to have been welded together with FE depositions.

22:38:50. The geology has transitioned to possible FE pillow basalt structures that are partially covered with FE talus composed of cobbles and boulders. Sediment cover is perhaps 20%.

22:55:49. The surface is composed of 80% FE pillow structures, 15% FE cobbles and pebbles, and ~5% light-colored sediment.

23:12:58. The surface is composed of perhaps 60% FE pillow structures, 30% FE cobbles and pebbles, and ~10% light-colored sediment. One of the cobbles was loose and was selected as the second geological sample of the expedition (~20 cm long axis diameter). It was placed in the portside rock box:

**D2\_DIVE08\_SPEC02GEO**

23:45:24. The terrain is not as steep as we approach the summit of this volcanic feature. The field of view is dominated by smooth surfaces, likely FE flows. FE cobbles and boulders are found in abundance between the flows, and sediment cover is <5%.

23:59:10. The terrain is dominated by FE pillow flows with scattered FE cobbles and pebbles. The sediment cover is ~20%. A cobble with a triangular top was sampled at this location, and is the third geologic sample of the dive. The sample was placed in the starboard rock box (it is likely the smaller of the two rocks in the box): **D2\_DIVE08\_SPEC04GEO**

00:21:54. The surface is again becoming rougher. FE pillow flows define most of the field of view, and FE cobbles that are “welded” to the flows provide additional topography on the surfaces of the flows. Sediment comprises ~5 to 10% of the surface cover.

00:24:40. The slope has increased to perhaps 25 degrees, the steepest yet observed in the dive. FE pillow basalts dominate the field of view. Just within the field of view, perhaps 5 or 10 meters from the ROV, the topography is distinctly rougher and looks to be either FE talus composed of cobble-sized rocks or FE nodules.

01:22:16. There was a long delay as the ROV attempted to sample an exceptionally small (2 or 3 cm) animal that appears to be the source of the sediment scoured “trails” on rock surfaces on this seamount (and at other seamounts on this expedition). The slope is perhaps 15 to 20 degrees and the field of view is dominated by FE pillows with relatively smooth surfaces.

**The biological perspective is as follows:**

Landed on a ~40-degree sloping terrain, composed of ferromanganese encrusted cobbles, some loose, some cemented. 21:45 3934m. Observed a dead *Caulophacus sp*-like glass sponge laying on ground. Small *Pleurogorgia* coral. Observing several potbelly sponges *Hyalonema*. *Freyastera*? Brisingid seastar on rocks. Observed different species of *Freyastera* close by. Collected rock D2\_DIVE08\_SPEC01GEO at 3917 m 22:15.

As we move upslope the terrain is mainly composed of cobbles cemented by ferromanganese crust and pockets of sediment. Observing several potbelly and stalked sponges *Caulophacus sp* (these sponges are different from *Bolosoma*, mainly have a slenderer long stalk and a smaller ‘head’ proportional to the stalk; they are in fact in different families). Highlight observation of a red/translucent sea cucumber (Family Synallactidae) with its anterior half raised into the water column (may be a reproductive behavior to release gametes).

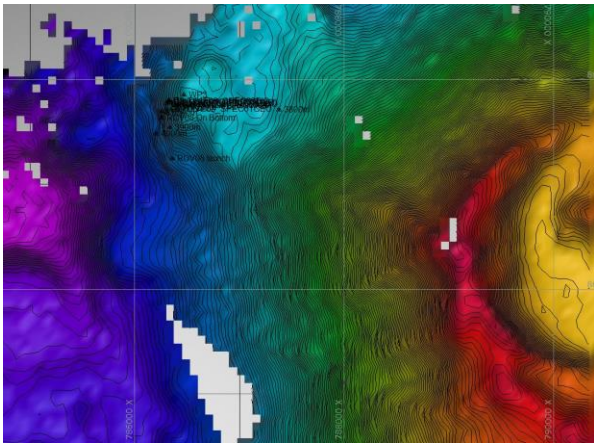
Observed several more potbelly sponges and small ophiuroids attached to rocks 22:54 3890 m. Same pattern of potbelly and ophiuroids being the most dominant animals here, not a large abundance. 23:12 3975m. Collected rock D2\_DIVE08\_SPEC02GEO at 23:16 3863 m.

Collected dead sponge stalk with crinoid, hydroids and anemone. D2\_DIVE08\_SPEC03BIO 23:37 3861 m. Observed several of these dead sponge stalks with several crinoids as the one collected. Observe several large *Caulophacus* sponges, intermixed with several dead sponge stalks with yellow crinoids 3851m 23:56. Observed a different sponge in the family Corbitellinae 23:59 3851 m.

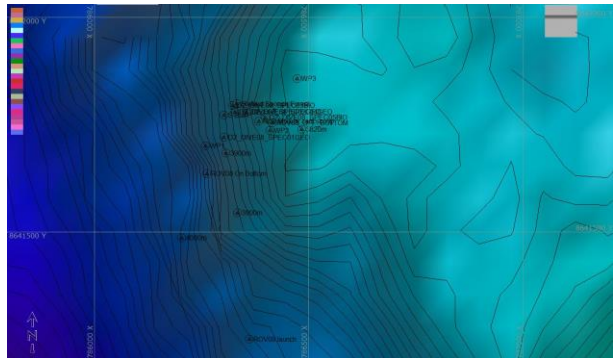
Collected rock D2\_DIVE08\_SPEC04GEO 00:14 3849m. Observed what looked to be like a **monoplacophoran** mollusk. 00:50 3838 m. An extremely rare observation. Known from soft bottom abyssal plains. First time seen alive by any of the experts participating. Truly exciting!!!!!! Attempted collection with scoop, but failed.

Observed the first and only fish of the dive at 01:23 a Cusk Eel (*Leucicorus*), 3827 m. Collected D2\_DIVE08\_SPEC05BIO dead sponge stalk with anemone, barnacle and crinoids (01:26, 3,826 m). Ended dive at the top of feature, observed several stalked sponges on the horizon.

Overall Map of the ROV Dive Area

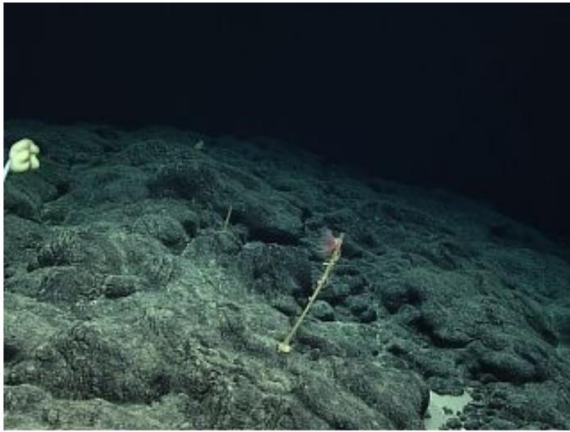


Close-up Map of Main Dive Site



Representative Photos of the Dive





EX1702\_IMG\_20170224T012711Z\_ROVHD.jpg



EX1702\_IMG\_20170224T011235Z\_ROVHD.jpg

**Gently sloping terrain of mostly exposed rock encrusted with iron-manganese. Several alive and dead stalked glass sponges attached to hard substrate**

**Close up of monoplocophoran associated with trails of 'clean' rock observed throughout the dive.**

**Samples Collected**

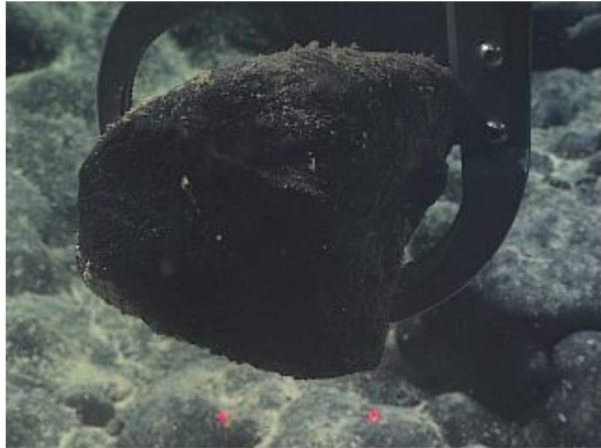

**Sample**



Sample ID	D2_DIVE08_SPEC01BIO
Date (UTC)	20170223
Time (UTC)	22:14:28
Depth (m)	3919.9894
Temperature (°C)	1.41114
Field ID(s)	rock



EX1702\_IMG\_20170223T221105Z\_ROVHD.jpg

Comments

Sample	
Sample ID	D2_DIVE08_SPEC02GEO
Date (UTC)	20170223
Time (UTC)	23:16:07
Depth (m)	3873.2125
Temperature ( °C)	1.44872
Field ID(s)	Rock
Comments	
 <p>EX1702_IMG_20170223T231431Z_ROVHD.jpg</p>	
Sample	
Sample ID	D2_DIVE08_SPEC03BIO
Date (UTC)	20170223
Time (UTC)	23:37:39
Depth (m)	3861.7208
Temperature ( °C)	1.47184
Field ID(s)	Commatulid Crinoid on sponge stalk
Comments	
 <p>EX1702_IMG_20170223T233327Z_ROVHD.jpg</p>	

Sample	
Sample ID	D2_DIVE08_SPEC04GEO
Date (UTC)	20170224
Time (UTC)	00:15:13
Depth (m)	3847.5135
Temperature ( ° C)	1.50309
Field ID(s)	rock
Comments	
 EX1702_IMG_20170224T001315Z_ROVHD.jpg	
Sample	
Sample ID	D2_DIVE08_SPEC05BIO
Date (UTC)	20170224
Time (UTC)	01:40:45
Depth (m)	3710.8195
Temperature ( ° C)	1.45730
Field ID(s)	Anemone on stalked sponge, crinoids
Comments	
 EX1702_IMG_20170224T013049Z_ROVHD.jpg	
Sample	
Sample ID	
Date (UTC)	
Time (UTC)	
Depth (m)	
Temperature ( ° C)	
Field ID(s)	
Comments	A third biology sample was not collected



**Please direct inquiries to:**

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